

IN THE CLAIMS

Please amend the claims as follows:

Claim 1 (Previously Presented): A package substrate comprising:

a lower level interlayer resin insulating layer;

a lower via hole formed in the lower level interlayer resin insulating layer;

an outermost interlayer resin insulating layer formed over the lower level interlayer resin insulating layer;

a pad structure formed on the outermost interlayer resin insulating layer;

a solder resist formed on the outermost interlayer resin insulating layer and the pad structure, the solder resist having an opening exposing a partially exposed portion of the pad structure;

a conductive connecting pin configured to establish an electrical connection with another substrate, the conductive connecting pin being secured to the partially exposed portion of the pad structure via a solder, the solder being disposed over at least one metal layer formed only in the partially exposed portion of the pad structure; and

a via hole formed through the outermost interlayer resin insulating layer and configured to electrically connect the pad structure to at least one conductive circuit formed below the outermost interlayer resin insulating layer, the via hole being positioned directly below the pad structure and directly on the at least one conductive circuit, wherein the planar area of the pad structure is greater than the planar area of the conductive circuit.

Claims 2-89 (Canceled)

Claim 90 (Previously Presented): The package structure according to claim 1, further comprising:

at least one conductor layer comprising a plurality of conductor circuits formed below the lower level interlayer resin insulating layer; and

at least one interlayer resin insulating layer having the lower level interlayer resin insulating layer formed below the at least one conductive circuit, wherein the conductor layer and the interlayer resin insulating layer are alternately formed.

Claim 91 (Previously Presented): The package structure according to claim 1, wherein the pad structure comprises an outermost conductor portion formed on the outermost interlayer resin insulating layer.

Claim 92 (Previously Presented): The package structure according to claim 1, wherein the pad structure comprises an outermost conductor portion formed on the outermost interlayer resin insulating layer and the at least one conductive circuit is positioned directly below the pad structure.

Claim 93 (Previously Presented): The package structure according to claim 90, wherein the pad structure comprises an outermost conductor portion formed on the outermost interlayer resin insulating layer and the at least one conductive circuit is positioned directly below the pad structure.

Claim 94 (Previously Presented): The package structure according to claim 90, wherein the lower via hole directly connected to the at least one conductive circuit and formed through the lower level interlayer resin insulating layer formed below the at least one

conductive circuit, the lower via hole being configured to electrically connect the via hole to at least one of the conductor circuits in the at least one conductor layer.

Claim 95 (Previously Presented): The package structure according to claim 1, wherein the pad structure comprises a plane layer.

Claim 96 (Previously Presented): The package structure according to claim 1, further comprising a signal line formed on the outermost interlayer resin insulating layer, wherein the signal line connects to the pad structure, and the signal line is covered with the solder resist.

Claim 97 (Previously Presented): The package structure according to claim 1, wherein a diameter of the pad structure is 1.02 times to 100 times a diameter of the opening.

Claim 98 (Previously Presented): The package structure according to claim 1, wherein the conductive connecting pin comprises a columnar connection portion and a plate-like secured portion, the secured portion is secured to the pad through the solder, and the conductive connecting pin comprises at least one of Cu, a copper alloy, Ti, Zn, Al and a noble metal.

Claim 99 (Previously Presented): The package structure according to claim 98, wherein the columnar connection portion has a constriction portion having a diameter which is smaller than a diameter of other portion.

Claim 100 (Previously Presented): The package structure according to claim 1, wherein the pad structure has a roughened surface.

Claim 101 (Previously Presented): The package structure according to claim 92, wherein the pad structure has a roughened surface.

Claim 102 (Previously Presented): The package structure according to claim 94, wherein the pad structure has a roughened surface.

Claim 103 (Previously Presented): A package substrate comprising:  
a lower level interlayer resin insulating layer;  
a lower via hole formed in the lower level interlayer resin insulating layer;  
an outermost interlayer resin insulating layer formed over the lower level interlayer resin insulating layer;  
a pad structure formed on the outermost interlayer resin insulating layer;  
a solder resist formed on the outermost interlayer resin insulating layer and the pad structure, the solder resist having an opening exposing a partially exposed portion of the pad structure;

conductive connecting means for establishing an electrical connection with another substrate, the conductive connecting means being secured to the partially exposed portion of the pad structure via solder, the solder being disposed over at least one metal layer formed only in the partially exposed portion of the pad structure; and

a via hole formed through the outermost interlayer resin insulating layer and configured to electrically connect the pad structure to at least one conductive circuit formed below the outermost interlayer resin insulating layer, the via hole being positioned directly below the pad structure and directly on the at least conductive circuit, wherein the planar area of the pad structure is greater than the planar area of the conductive circuit.

Claim 104 (Previously Presented): The package structure according to claim 103, further comprising:

at least one conductor layer comprising a plurality of conductor circuits formed below the lower level interlayer resin insulating layer; and

at least one interlayer resin insulating layer having the lower level interlayer resin insulating layer formed below the at least one conductive circuit, wherein the conductor layer and the interlayer resin insulating layer are alternately formed.

Claim 105 (Previously Presented): The package structure according to claim 103, wherein the pad structure comprises an outermost conductor portion formed on the outermost interlayer resin insulating layer.

Claim 106 (Previously Presented): The package structure according to claim 103, wherein the pad structure comprises an outermost conductor portion formed on the outermost interlayer resin insulating layer and the at least one conductive circuit is positioned directly below the pad structure.

Claim 107 (Previously Presented): The package structure according to claim 104, wherein the pad structure comprises an outermost conductor portion formed on the outermost interlayer resin insulating layer and the at least one conductive circuit is positioned directly below the pad structure.

Claim 108 (Previously Presented): The package structure according to claim 104, wherein the lower via hole directly connected to the at least one conductive circuit and

formed through the at least one lower level interlayer resin insulating layer formed below the at least one conductive circuit, the lower via hole being configured to electrically connect the via hole to at least one of the conductor circuits in the at least one conductor layer.

Claim 109 (Previously Presented): The package structure according to claim 103, wherein the pad structure comprises a plane layer.

Claim 110 (Previously Presented): The package structure according to claim 103, further comprising a signal line formed on the outermost interlayer resin insulating layer, wherein the signal line connects to the pad structure, and the signal line is covered with the solder resist.

Claim 111 (Previously Presented): The package structure according to claim 103, wherein a diameter of the pad structure is 1.02 times to 100 times a diameter of the opening.

Claim 112 (Previously Presented): The package structure according to claim 103, wherein the conductive connecting means comprises at least one of Cu, a copper alloy, Ti, Zn, Al and a noble metal.

Claim 113 (Previously Presented): The package structure according to claim 103, wherein the pad structure has a roughened surface.

Claim 114 (Previously Presented): The package structure according to claim 106, wherein the pad structure has a roughened surface.

Claim 115 (Previously Presented): The package structure according to claim 108, wherein the pad structure has a roughened surface.

Claim 116 (Previously Presented): The package structure according to claim 1, wherein the at least one metal layer formed in the partially exposed portion of the pad structure comprises a plurality of metal layers.

Claim 117 (Previously Presented): The package structure according to claim 1, wherein the at least one metal layer formed in the partially exposed portion of the pad structure comprises at least one metal which prevents corrosion.

Claim 118 (Previously Presented): The package structure according to claim 1, wherein the at least one metal layer formed in the partially exposed portion of the pad structure comprises at least one material selected from the group consisting of gold, silver, copper, nickel, tin, aluminum, lead, phosphorus, chrome, tungsten, molybdenum, titanium, platinum and solder.

Claim 119 (Previously Presented): The package structure according to claim 103, wherein the at least one metal layer formed in the partially exposed portion of the pad structure comprises a plurality of metal layers.

Claim 120 (Previously Presented): The package structure according to claim 103, wherein the at least one metal layer formed in the partially exposed portion of the pad structure comprises at least one metal which prevents corrosion.

Claim 121 (Previously Presented): The package structure according to claim 103, wherein the at least one metal layer formed in the partially exposed portion of the pad structure comprises at least one material selected from the group consisting of gold, silver, copper, nickel, tin, aluminum, lead, phosphorus, chrome, tungsten, molybdenum, titanium, platinum and solder.

Claim 122 (Previously Presented): The package structure according to claim 1, wherein the at least one metal layer is formed in the partially exposed portion of the pad structure after the opening is formed in the solder resist.

Claim 123 (Previously Presented): The package structure according to claim 103, wherein the at least one metal layer is formed in the partially exposed portion of the pad structure after the opening is formed in the solder resist.

Claim 124 (Previously Presented): A package substrate comprising:  
an outermost interlayer resin insulating layer;  
a pad structure comprising an outermost conductor portion formed on the outermost interlayer resin insulating layer and a via hole formed through the outermost interlayer resin insulating layer;  
a solder resist formed on the outermost interlayer resin insulating layer and the pad structure, the solder resist having an opening exposing a partially exposed portion of the pad structure;  
a conductive connecting pin configured to establish an electrical connection with another substrate, the conductive connecting pin being secured to the partially exposed



portion of the pad structure via a solder, the solder being disposed over at least one metal layer formed only in the partially exposed portion of the pad structure; and

at least one conductive circuit formed below the outermost interlayer resin insulating layer and connecting with the outermost conductor portion through the via hole, the at least one conductive circuit being positioned directly below the pad structure, wherein the planar area of the pad structure is greater than the planar area of the conductive circuit.

Claim 125 (Previously Presented): The package structure according to claim 124, further comprising:

at least one conductor layer comprising a plurality of conductor circuits formed below the outermost interlayer resin insulating layer; and

at least one interlayer resin insulating layer formed below the at least one conductive circuit, wherein the conductor layer and the interlayer resin insulating layer are alternately formed.

Claim 126 (Previously Presented): The package structure according to claim 124, further comprising:

an interlayer resin insulating layer formed below the conductive circuit;

a conductor layer comprising a plurality of conductor circuits formed below the interlayer resin insulating layer; and

at least one lower via hole directly connected to the conductive circuit and formed through the interlayer resin insulating layer, the at least one lower via hole being configured to electrically connect the via hole to at least one of the conductor circuits in the conductor layer.

Claim 127 (Previously Presented): The package structure according to claim 124, wherein the pad structure comprises a plane layer.

Claim 128 (Previously Presented): The package structure according to claim 124, further comprising a signal line formed on the outermost interlayer resin insulating layer, wherein the signal line connects to the pad structure, and the signal line is covered with the solder resist.

Claim 129 (Previously Presented): The package structure according to claim 124, wherein a diameter of the pad structure is 1.02 times to 100 times a diameter of the opening.

Claim 130 (Previously Presented): The package structure according to claim 124, wherein the conductive connecting pin comprises at least one of Cu, a copper alloy, Ti, Zn, Al and a noble metal.

Claim 131 (Previously Presented): The package structure according to claim 124, wherein the pad structure has a roughened surface.

Claim 132 (Previously Presented): The package structure according to claim 128, wherein the pad structure has a roughened surface.

Claim 133 (Previously Presented): The package structure according to claim 1, wherein the solder being disposed over at least one metal layer formed only in the partially exposed portion of the pad structure such that the solder is within the opening of the solder resist layer.

Claim 134 (Previously Presented): The package structure according to claim 1, wherein the solder being disposed over at least one metal layer formed only in the partially exposed portion of the pad structure such that contact between the solder and the at least one metal layer is entirely within the opening of the solder resist layer.

Claim 135 (Previously Presented): The package structure according to claim 1, wherein the solder being disposed over at least one metal layer formed only in the partially exposed portion of the pad structure such that the solder completely covers the at least one metal layer and contact between the solder and the at least one metal layer is entirely within the opening of the solder resist layer.

Claim 136 (Previously Presented): The package structure according to claim 1, wherein the solder being disposed over at least one metal layer formed only in the partially exposed portion of the pad structure such that contact between the solder and the at least one metal layer is entirely within the opening of the solder resist layer.

Claim 137 (Previously Presented): The package structure according to claim 103, wherein the solder being disposed over at least one metal layer formed only in the partially exposed portion of the pad structure such that the solder is within the opening of the solder resist layer.

Claim 138 (Previously Presented): The package structure according to claim 103, wherein the solder being disposed over at least one metal layer formed only in the partially exposed portion of the pad structure such that the solder completely covers the at least one

metal layer and contact between the solder and the at least one metal layer is entirely within the opening of the solder resist layer.

Claim 139 (Previously Presented): The package substrate of Claim 103, wherein said opening in the solder resist comprises:

a bottom formed by said partially exposed portion of the pad structure; and

a sidewall extending from the bottom in a direction of thickness of the solder resist to a planar surface of the solder resist, wherein said at least one metal layer formed only in the partially exposed portion of the pad structure consists of the at least one metal layer formed only on the bottom of the opening.

Claim 140 (Previously Presented): The package substrate of Claim 103, wherein said at least one metal layer comprises an edge surface extending in a direction of thickness of the at least one metal layer, wherein the edge portion touches the sidewall.

Claim 141 (Currently Amended): The package substrate of Claim 1, wherein the pad structure connects with a conductor circuit which is formed on the ~~core~~ substrate.

Claim 142 (Currently Amended): The package substrate of Claim 103, wherein the pad structure connects with a conductor circuit which is formed on the ~~core~~ substrate.

Claim 143 (New): The package substrate of Claim 1, further comprising a resin insulating substrate, wherein said lower level interlayer resin insulating layer is formed over the resin insulating substrate.

Claim 144 (New): The package substrate of Claim 103, further comprising a resin insulating substrate, wherein said lower level interlayer resin insulating layer is formed over the resin insulating substrate.

Claim 145 (New): The package substrate of Claim 124, further comprising a resin insulating substrate, wherein said outermost interlayer resin insulating layer is formed over the resin insulating substrate.